Evaluation of Commercial Compression Garments as a Countermeasure to Post-Spaceflight Orthostatic Intolerance (OIG DSO641)

Completed Technology Project (2010 - 2012)

Project Introduction

One of the most important physiological changes that may negatively impact crew safety is post-flight orthostatic intolerance. Astronauts who have orthostatic intolerance are unable to maintain a normal systolic blood pressure during head-up tilt, have elevated heart rates, and may experience presyncope or syncope with upright posture. This problem affects about 20-30% of astronauts who fly short-duration missions (4–18 days) and 60-80% of astronauts who fly long-duration missions. This condition creates a potential hazard for crew members during re-entry and after landing, especially for emergency egress contingencies. Two countermeasures are currently employed to ameliorate post-flight orthostatic intolerance: fluid loading and an anti-gravity suit. Unfortunately, neither of these is completely effective for all phases of landing and egress; thus, continued countermeasure development is important. Preliminary evidence has shown that commercial graded compression garments that include abdominal compression can significantly improve orthostatic tolerance. The specific aims of this study were: 1. Evaluate custom-fitted, commercial compression garments as countermeasures to post-flight orthostatic intolerance during stand tests performed before and after spaceflight. 2. Determine if these garments, which provide a continuous, graded compression from the foot to the hip, with a static compression over the lower abdomen, provide superior fit and comfort as well as being easier to don.

Anticipated Benefits

The gradient compression garments prevented the tachycardia and stroke volume reduction normally associated with a 3.5 min stand test after spaceflight. The garments show promise as a countermeasure against post-spaceflight orthostatic intolerance, can be easily donned, and are relatively comfortable to wear.

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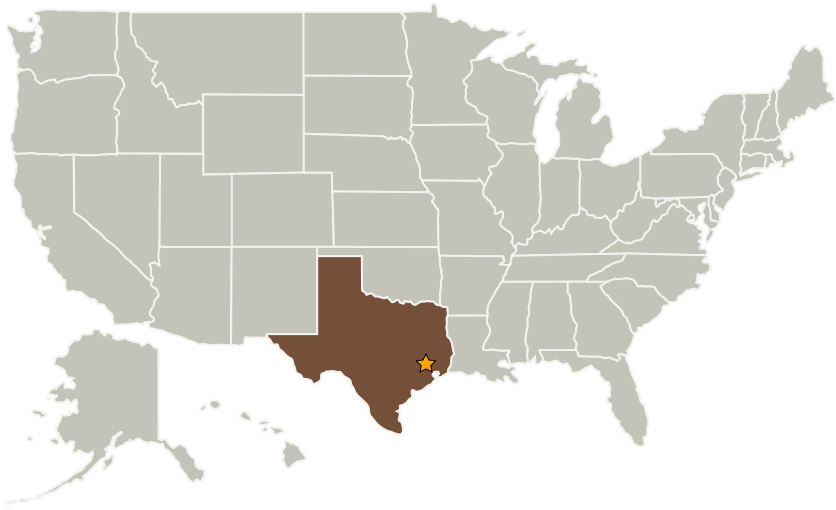
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Universities Space Research Association(USRA)	Supporting Organization	R&D Center	Huntsville, Alabama
Wyle Laboratories, Inc.	Supporting Organization	Industry	

Primary U.S. Work Locations
Texas

Project Transitions

February 2010: Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Operations Mission Directorate (SOMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Human Spaceflight Capabilities

Project Management

Program Director:

David K Baumann

Project Manager:

Jennifer D Villarreal

Principal Investigator:

Steven H Platts

Co-Investigators:

Stuart M.c. Lee
Michael B Stenger
James P Locke
Christian M Westby

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Completed Technology Project (2010 - 2012)

April 2012: Closed out

Closeout Summary: Results from this study indicate that the gradient compression garments prevented the tachycardia and stroke volume reduction normally associated with a 3.5 min stand test after spaceflight. The garments show promise as a countermeasure against post-spaceflight orthostatic intolerance, can be easily donned, and are relatively comfortable to wear. The efficacy of the garments should be validated after and during recovery from long-duration spaceflight. [Ed. note 9/12/13: information from PI's Task Book Initial Entry Form, provided September 2013]

Stories

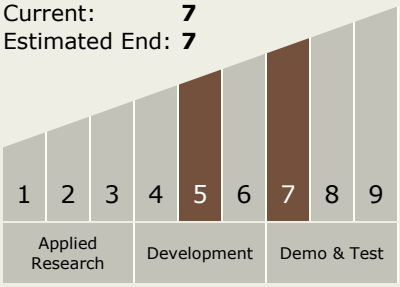
Articles in Peer-reviewed Journals
(https://techport.nasa.gov/file/25399)

Project Website:

https://taskbook.nasaprs.com

Technology Maturity (TRL)

Start: **5**
Current: **7**
Estimated End: **7**



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.3 Human Health and Performance
    - TX06.3.2 Prevention and Countermeasures

Target Destinations

The Moon, Mars